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TITLE: Laminar non-linear device with magnetically aligned particles

DEPR:

In order to improve the electrical performance of devices of the invention, it is preferred that the first composition and the second composition comprise at least one additional particulate filler, i.e. a third particulate filler for the first composition and a fourth particulate filler for the second composition. This additional particulate filler may be the same for both the first and second compositions, or it may be different. In addition, the additional particulate filler may comprise a mixture of two or more different materials, which may be the same or different, and in the same concentration or different concentrations, for the first and second compositions. The third particulate filler is present in an amount of 0 to 60%, preferably 5 to 50%, particularly 10 to 40% by total volume of the first composition. The fourth particulate filler is present in an amount of 0 to 60%, preferably 5 to 50%, particularly 10 to 40% by total volume of the second composition. Particularly preferred for use as the third or fourth particulate fillers are arc suppressing agents or flame retardants, and oxidizing agents. Compositions with particularly good performance under high current conditions, e.g. 250 A, have been prepared when the third and/or the fourth particulate filler comprises a mixture of (i) an arc suppressing agent or flame retardant, and (ii) an oxidizing agent. It is preferred that the oxidizing agent be present in an amount 0.1 to 1.0 times that of the arc suppressing agent or flame retardant. The oxidizing agent is generally present at 0 to 20%, preferably 5 to 15% by total volume of the first composition, and/or at 0 to 20%, preferably 5 to 15% by total volume of the second composition. Particularly good results are achieved when the oxidizing agent is coated onto the arc suppressing agent or flame retardant prior to mixing. Suitable arc suppressing agents and flame retardants include zinc borate, magnesium hydroxide, alumina trihydrate, aluminum phosphate, barium hydrogen phosphate, calcium phosphate (tribasic or dibasic), copper pyrophosphate, iron phosphate, lithium phosphate, magnesium phosphate, nickel phosphate, zinc phosphate, calcium oxalate, iron (II) oxalate, manganese oxalate, strontium oxalate, and aluminum trifluoride trihydrate. It is important that any decomposition products of the arc suppressing agent be electrically nonconductive. Suitable oxidizing agents include potassium permanganate, ammonium persulfate, magnesium perchlorate, manganese dioxide,

ammonium persulfate, magnesium perchlorate, manganese dioxide, bismuth subnitrate, magnesium dioxide, lead dioxide (also called lead peroxide), and barium dioxide. While we do not wish to be bound by any theory, it is believed that the presence of the arc suppressing agent or flame retardant, and the oxidizing agent controls the plasma chemistry of the plasma generated during an electrical discharge, and provides discharge products that are nonconductive.